



SEQUENCE LISTING

<110> Marks, James D
Amersdorfer, Peter

<120> Therapeutic Monoclonal Antibodies That Neutralize
Botulinum Neurotoxins

<130> 2500.117USO

<140> US 09/144,986

<141> 1998-08-31

<160> 98

<170> PatentIn Ver. 2.0

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linker

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<211> 5

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linker

<400> 2

Ser Ser Ser Ser Gly
1 5

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linker

<400> 3

Ser Ser Ser Ser Gly Ser Ser Ser Ser Gly Ser Ser Ser Ser Gly
1 5 10 15

<210> 4

<211> 5

<212> PRT
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 <400> 4
 Gly Gly Gly Gly Ser
 1 5

 <210> 5
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 hexahistidine tag

 <400> 5
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 <210> 6
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 <400> 6
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 <210> 7
 <211> 23
 <212> DNA
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 <223> Description of Artificial Sequence: mouse heavy
 chain constant region MlgG1/2 For primer

 <400> 7
 ctggacaggg atccagagtt cca 23

 <210> 8
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 chain constant region MlgG3 For primer

 <400> 8
 ctggacaggg ctccatagtt c 21

 <210> 9

<211> 24
 <212> DNA
 <213> Artificial Sequence

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 region MCKappa For primer

 <400> 9
 ctcattcctg ttgaagctct tgac 24

 <210> 10
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 primer

 <400> 10
 gaggtgcagc ttcaggagtc agg 23

 <210> 11
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 <400> 11
 gatgtgcagc ttcaggagtc rgg 23

 <210> 12
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 primer

 <400> 12
 caggtgcagc tgaagsagtc agg 23

 <210> 13
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 back primer

 <400> 13
 gaggtycagc tgcarcartc tgg 23

 <210> 14
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 back primer

 <400> 14
 caggtycarc tgcagcagyc tgg 23

 <210> 15
 <211> 23
 <212> DNA
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 primer

 <400> 15
 gargtgaagc tgggtggartc tgg 23

 <210> 16
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 back primer

 <400> 16
 gaggttcagc ttcagcagtc tgg 23

 <210> 17
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 back primer

 <400> 17
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 back primer

 <400> 18
 cagatccagt tgctgcagtc tgg 23

 <210> 19
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<223> Description of Artificial Sequence: mouse VH1 back primer 2

<400> 19

gacattgtga tgwcacagtc tcc

23

<210> 20

<211> 23

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<223> Description of Artificial Sequence: mouse VH2 Back primer 2

<400> 20

gatgttktga tgacccaaac tcc

23

<210> 21

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<223> Description of Artificial Sequence: mouse VH3 back primer 2

<400> 21

gatattgtga tracbcaggc wgc

23

<210> 22

<211> 23

<212> DNA

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<223> Description of Artificial Sequence: mouse VH4 back primer 2

<400> 22

gacattgtgc tgacmcartc tcc

23

<210> 23

<211> 23

<212> DNA

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<223> Description of Artificial Sequence: mouse VH5 back primer 2

<400> 23

saaawtgtkc tcacccagtc tcc

23

<210> 24

<211> 23

<212> DNA

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 primer 2

 <400> 24
 gayatyvwga tgacmcagwc tcc 23

 <210> 25
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 primer 2

 <400> 25
 caaattgttc tcacccagtc tcc 23

 <210> 26
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 primer 2

 <400> 26
 tcattattgc aggtgcttgt ggg 23

 <210> 27
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 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: mouse JH1 For
 primer

 <400> 27
 tgaggagacg gtgaccgtgg tccc 24

 <210> 28
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 <223> Description of Artificial Sequence: mouse JH2 For
 primer

 <400> 28
 tgaggagact gtgagagtgg tgcc 24

 <210> 29
 <211> 24
 <212> DNA
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<220>
 <223> Description of Artificial Sequence: mouse JH3 For
 primer

 <400> 29
 tgcagagaca gtgaccagag tccc 24

 <210> 30
 <211> 24
 <212> DNA
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 <223> Description of Artificial Sequence: mouse JH4 For
 primer

 <400> 30
 tgaggagacg gtgactgagg ttcc 24

 <210> 31
 <211> 24
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: mouse JK1 For
 primer

 <400> 31
 tttgatttcc agcttggtgc ctcc 24

 <210> 32
 <211> 24
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: mouse JK2 For
 primer

 <400> 32
 ttttatttcc agcttggtcc cccc 24

 <210> 33
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 <223> Description of Artificial Sequence: mouse JK3 For
 primer

 <400> 33
 ttttatttcc agtctggtcc catc 24

 <210> 34
 <211> 24
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<223> Description of Artificial Sequence: mouse JK4 For primer

<400> 34
 ttttatttcc aactttgtcc ccga 24

<210> 35
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 <223> Description of Artificial Sequence: mouse JK5 For primer

<400> 35
 tttcagctcc agcttggtcc cagc 24

<210> 36
 <211> 56
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 <223> Description of Artificial Sequence: mouse VH1 Sfi back primer

<400> 36
 gtccctcgcaa ctgcggccca gccggccatg gccgaggtgc agcttcagga gtcagg 56

<210> 37
 <211> 56
 <212> DNA
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<220>
 <223> Description of Artificial Sequence: mouse VH2 Sfi back primer

<400> 37
 gtccctcgcaa ctgcggccca gccggccatg gccgatgtgc agcttcagga gtcrgg 56

<210> 38
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 <223> Description of Artificial Sequence: mouse VH3 Sfi back primer

<400> 38
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<210> 39
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Sfi back primer

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<210> 40
<211> 56
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<223> Description of Artificial Sequence: mouse VH5/9
Sfi back primer

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gtcctcgcaa ctgcgggccca gccggccatg gccaggtgc arctgcagca gyctgg 56

<210> 41
<211> 56
<212> DNA
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<223> Description of Artificial Sequence: mouse VH7 Sfi
back primer

<400> 41
gtcctcgcaa ctgcgggccca gccggccatg gccgargtga agctggtgga rtctgg 56

<210> 42
<211> 56
<212> DNA
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<223> Description of Artificial Sequence: mouse VH8 Sfi
back primer

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gtcctcgcaa ctgcgggccca gccggccatg gccgaggttc agcttcagca gtctgg 56

<210> 43
<211> 56
<212> DNA
<213> Artificial Sequence

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<223> Description of Artificial Sequence: mouse VH10 Sfi
back primer

<400> 43
gtcctcgcaa ctgcgggccca gccggccatg gccgaagtgc agctgktgga gwctgg 56

<210> 44
<211> 56
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: mouse VH11 Sfi
back primer

<400> 44
 gtcctcgcaa ctgcggccca gccggccatg gccagatcc agttgctgca gtctgg 56

 <210> 45
 <211> 48
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> Description of Artificial Sequence: mouse Jkappa1
 Not forward primer

 <400> 45
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 <210> 46
 <211> 48
 <212> DNA
 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: mouse Jkappa2
 Not forward primer

 <400> 46
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 <210> 47
 <211> 48
 <212> DNA
 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: mouse Jkappa3
 Not forward primer

 <400> 47
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 <210> 48
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 Not forward primer

 <400> 48
 gagtcattct cgacttgcgg ccgcttttat ttccaacttt gtccccga 48

 <210> 49
 <211> 48
 <212> DNA
 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: mouse Jkappa5
 Not forward primer

<400> 49
gagtcattct cgacttgccg cgcctttcag ctccagcttg gtcccagc 48

<210> 50
<211> 7
<212> PRT
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<223> Description of Artificial Sequence: Gly4Ser3
linker

<400> 50
Gly Gly Gly Gly Ser Ser Ser
1 5

<210> 51
<211> 125
<212> PRT
<213> Artificial Sequence

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<223> Description of Artificial Sequence: BoNT/A clone
C15 region VH epitope 1

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Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
1 5 10 15
Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30
Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45
Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
50 55 60
Glu Asp Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95
Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Gly Gly Asn Tyr Tyr Ala Met
100 105 110
Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Ala Ser Ser
115 120 125

<210> 52
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
C9 region VH epitope 1

<400> 52

Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
1 5 10 15
Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30
Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45
Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
50 55 60
Glu Asn Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95
Ala Arg Gly Ile Tyr Tyr Val Tyr Asp Gly Gly Asn Tyr Tyr Ala Met
100 105 110
Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

<210> 53

<211> 125

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1D5 region VH epitope 1

<400> 53

Glu Val Lys Leu Val Glu Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
1 5 10 15
Ser Val Asn Leu Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30
Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45
Gly Met Ile His Pro Ser Asn Ser Glu Thr Arg Leu Asn Gln Lys Phe
50 55 60
Lys Asp Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80
Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95
Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Glu Gly Tyr Tyr Tyr Thr Leu
100 105 110
Asp Tyr Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser
115 120 125

<210> 54
<211> 121
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<223> Description of Artificial Sequence: BoNT/A clone
C1 region VH epitope 1

<400> 54

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gln | Val | Lys | Leu | Gln | Gln | Ser | Gly | Ala | Glu | Leu | Val | Arg | Pro | Gly | Ala | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| Ser | Val | Lys | Leu | Ser | Cys | Lys | Ala | Ser | Gly | Tyr | Ser | Phe | Thr | Ser | Tyr | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Trp | Met | Asn | Trp | Val | Lys | Gln | Arg | Pro | Gly | Gln | Gly | Leu | Glu | Trp | Ile | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Gly | Met | Ile | His | Pro | Ser | Asn | Ser | Asp | Thr | Arg | Phe | Asn | Gln | Lys | Phe | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| Glu | Asp | Lys | Ala | Thr | Leu | Thr | Val | Asp | Arg | Ser | Ser | Ser | Thr | Ala | Ile | |
| | 65 | | | | 70 | | | | 75 | | | | | | 80 | |
| His | Gln | Leu | Ser | Ser | Pro | Thr | Ser | Glu | Asp | Ser | Ala | Val | Tyr | Tyr | Cys | |
| | | | | 85 | | | | | 90 | | | | | 95 | | |
| Ala | Arg | Gly | Leu | Tyr | Gly | Tyr | Gly | Phe | Trp | Tyr | Phe | Asp | Val | Trp | Gly | |
| | | | 100 | | | | | 105 | | | | | 110 | | | |
| Gln | Gly | Thr | Thr | Val | Thr | Val | Ser | Ser | | | | | | | | |
| | | 115 | | | | | 120 | | | | | | | | | |

<210> 55
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<212> PRT
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
S25 region VH epitope 1

<400> 55

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gln | Val | Lys | Leu | Gln | Gln | Ser | Gly | Ala | Glu | Leu | Val | Arg | Pro | Gly | Ala | |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | | |
| Ser | Val | Lys | Leu | Ser | Cys | Lys | Ala | Ser | Gly | Tyr | Ser | Leu | Thr | Ser | Tyr | |
| | | | 20 | | | | | 25 | | | | | 30 | | | |
| Trp | Met | Asn | Trp | Val | Lys | Gln | Arg | Pro | Gly | Gln | Gly | Leu | Glu | Trp | Ile | |
| | | 35 | | | | | 40 | | | | | 45 | | | | |
| Gly | Met | Ile | His | Pro | Ser | Asp | Ser | Asp | Thr | Arg | Phe | Asn | Gln | Lys | Phe | |
| | 50 | | | | | 55 | | | | | 60 | | | | | |
| Glu | Asp | Lys | Ala | Thr | Leu | Thr | Val | Asp | Thr | Ser | Ser | Ser | Thr | Ala | Tyr | |
| | 65 | | | | 70 | | | | 75 | | | | | | 80 | |
| Met | Gln | Leu | Ser | Ser | Pro | Thr | Ser | Glu | Asp | Ser | Ala | Val | Tyr | Tyr | Cys | |

85

90

95

Ala Arg Gly Leu Tyr Asn Gly Phe Trp Tyr Phe Asp Val Trp Gly Gln
 100 105 110

Gly Thr Thr Val Thr Val Ser Ser
 115 120

<210> 56

<211> 117

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
 1B6 region VH epitope 1

<400> 56

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Val
 1 5 10 15

Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Ile Asp Tyr
 20 25 30

Ala Met His Trp Val Lys Gln Ser Pro Ala Lys Ser Leu Glu Trp Ile
 35 40 45

Gly Val Ile Ser Ser Tyr Tyr Gly Asp Thr Asp Tyr Asn Gln Ile Phe
 50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Asn Thr Ala Tyr
 65 70 75 80

Met Glu Leu Ala Arg Leu Thr Ser Asp Asp Ser Ala Ile Tyr Tyr Cys
 85 90 95

Ala Arg Arg Gly Lys Gly Ala Met Asp Tyr Trp Gly Gln Gly Thr Thr
 100 105 110

Val Thr Val Ser Ser
 115

<210> 57

<211> 117

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
 1C9 region VH epitope 1

<400> 57

Gln Val Gln Leu Lys Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Val
 1 5 10 15

Ser Val Lys Ile Ser Cys Lys Gly Ser Gly Tyr Thr Phe Ile Asp Tyr
 20 25 30

Ala Val His Trp Val Lys Gln Ser His Ala Lys Ser Leu Glu Trp Ile

<400> 59

Glu Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Gln
1 5 10 15

Ser Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Asp Tyr
20 25 30

Ala Trp Tyr Trp Ile Arg Gln Phe Pro Gly Lys Lys Leu Glu Trp Met
35 40 45

Gly Tyr Ile Ser Tyr Ser Gly Ser Thr Gly Tyr Asn Pro Ser Leu Lys
50 55 60

Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65 70 75 80

Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Gly Thr Tyr Tyr Cys Ala
85 90 95

Arg Gly Tyr Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr
100 105 110

Val Ser Ser
115

<210> 60

<211> 123

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1A1 region VH epitope 2

<400> 60

Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
1 5 10 15

Ser Arg Lys Leu Ser Cys Ala Thr Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Tyr Met Ser Trp Ile Arg Gln Ser Pro Asp Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Pro Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Val Arg His Gly Tyr Gly Asn Tyr Pro Ser His Trp Tyr Phe Asp Val
100 105 110

Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
115 120

<210> 61
 <211> 123
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1F1 region VH epitope 2

<400> 61
 Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
 1 5 10 15
 Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asn Tyr
 20 25 30
 Gly Met Ser Trp Val Arg Gln Thr Pro Asp Lys Arg Leu Glu Trp Val
 35 40 45
 Ala Met Ile Ser Ser Gly Gly Ser Tyr Asn Tyr Tyr Ser Asp Ser Val
 50 55 60
 Lys Gly Arg Val Thr Ile Ser Arg Asp Asn Ala Lys Ser Thr Leu Tyr
 65 70 75 80
 Leu Gln Met Ser Ser Leu Gln Ser Glu Asp Thr Ala Met Tyr Leu Cys
 85 90 95
 Thr Arg His Gly Tyr Gly Asn Tyr Pro Ser Tyr Trp Tyr Phe Asp Val
 100 105 110
 Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
 115 120

<210> 62
 <211> 118
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C39 region VH epitope 2

<400> 62
 Gln Val Gln Leu Gln Glu Ser Gly Gly Gly Ser Val Lys Pro Gly Gly
 1 5 10 15
 Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
 20 25 30
 Tyr Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
 35 40 45
 Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
 50 55 60
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
 65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Ile Tyr Tyr Cys
85 90 95

Val Arg Tyr Arg Tyr Asp Glu Gly Leu Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Val Thr Val Ser Ser
115

<210> 63
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
C25 region VH epitope 2

<400> 63
Gln Val Gln Leu Gln Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
1 5 10 15

Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Tyr Met Tyr Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ser Arg Tyr Arg Tyr Asp Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Val Thr Val Ser Ser
115

<210> 64
<211> 118
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<220>
<223> Description of Artificial Sequence: BoNT/A clone
2G5 region VH epitope 2

<400> 64
Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
1 5 10 15

Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
115

<210> 65
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<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
3C3 region VH epitope 2

<400> 65
Glu Val Lys Leu Lys Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
1 5 10 15

Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
115

<210> 66
<211> 118
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone

3F4 region VH epitope 2

<400> 66

```

Glu Gly Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
 1           5           10           15
Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
          20           25           30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
          35           40           45
Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
          50           55           60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
          65           70           75           80
Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
          85           90           95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
          100          105          110
Ser Val Thr Val Ser Ser
          115

```

<210> 67

<211> 118

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
3H4 region VH epitope 2

<400> 67

```

Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
 1           5           10           15
Pro Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
          20           25           30
Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
          35           40           45
Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
          50           55           60
Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
          65           70           75           80
Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
          85           90           95
Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
          100          105          110
Ser Val Thr Val Ser Ser
          115

```

<210> 68
 <211> 122
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1B3 region VH epitope 3

<400> 68
 Glu Val Gln Leu Gln Glu Ser Gly Gly Gly Val Val Gln Pro Gly Arg
 1 5 10 15
 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30
 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45
 Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
 50 55 60
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
 65 70 75 80
 Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
 85 90 95
 Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Tyr Gly Met Asp Val Trp
 100 105 110
 Gly Gln Gly Thr Thr Val Ile Val Ser Ser
 115 120

<210> 69
 <211> 122
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1C6 region VH epitope 3

<400> 69
 Gln Ile Gln Leu Leu Gln Ser Gly Gly Gly Val Val Gln Pro Gly Arg
 1 5 10 15
 Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
 20 25 30
 Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
 35 40 45
 Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
 50 55 60
 Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
 65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Tyr Gly Met Asp Val Trp
100 105 110

Gly Gln Gly Thr Thr Val Ile Val Ser Ser
115 120

<210> 70

<211> 121

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
2B6 region VH epitope 3

<400> 70

Val Lys Leu Val Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Gln Ser
1 5 10 15

Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Ser Asp Tyr
20 25 30

Ala Trp Asn Trp Ile Arg Gln Phe Pro Gly Asn Lys Leu Glu Trp Met
35 40 45

Gly Tyr Ile Asn Tyr Asp Gly Ser Asn Asn Tyr Asn Pro Ser Leu Lys
50 55 60

Asn Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65 70 75 80

Lys Leu Asn Ser Val Thr Ser Glu Asp Thr Ala Thr Tyr Tyr Cys Ala
85 90 95

Arg Ala Gly Asp Gly Tyr Tyr Val Asp Trp Tyr Phe Asp Val Trp Gly
100 105 110

Thr Gly Thr Thr Val Ile Val Ser Ser
115 120

<210> 71

<211> 117

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1G5 region VH epitope 3

<400> 71

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Gln Pro Gly Ala
1 5 10 15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
20 25 30

Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
 35 40 45
 Gly Asp Ile Tyr Pro Gly Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
 50 55 60
 Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
 65 70 75 80
 Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
 85 90 95
 Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
 100 105 110
 Val Ile Val Ser Ser
 115

<210> 72
 <211> 117
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1H6 region VH epitope 3

<400> 72
 Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
 1 5 10 15
 Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Tyr
 20 25 30
 Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
 35 40 45
 Gly Asp Ile Tyr Pro Asp Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
 50 55 60
 Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
 65 70 75 80
 Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
 85 90 95
 Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
 100 105 110
 Val Ile Val Ser Ser
 115

<210> 73
 <211> 119
 <212> PRT
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1F3 region VH epitope 4

<400> 73

Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15
Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
20 25 30
Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45
Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Glu Phe Lys
50 55 60
Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80
Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95
Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
100 105 110
Thr Thr Val Thr Val Ser Ser
115

<210> 74

<211> 119

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
2E8 region VH epitope 4

<400> 74

Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15
Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
20 25 30
Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45
Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Lys Phe Lys
50 55 60
Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80
Met Glu Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95
Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
100 105 110
Thr Thr Val Thr Val Ser Ser

<210> 75
 <211> 107
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C15 region VL epitope 1

<400> 75
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1 5 10 15
 Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser His Met
 20 25 30
 Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
 35 40 45
 Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Ile Arg Phe Ser Gly Ser
 50 55 60
 Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
 65 70 75 80
 Asp Ser Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Phe Thr
 85 90 95
 Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
 100 105

<210> 76
 <211> 107
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C9 region VL epitope 1

<400> 76
 Asp Ile Asp Leu Thr Gln Ser Pro Ala Ile Met Ser Ser Ser Pro Gly
 1 5 10 15
 Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30
 His Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Pro Trp Ile Tyr
 35 40 45
 Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
 50 55 60
 Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Val Glu Ala Glu
 65 70 75 80
 Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ser Gly Tyr Pro Leu Thr

| | | |
|----|----|----|
| 85 | 90 | 95 |
|----|----|----|

Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
 100 105

<210> 77
 <211> 109
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1D5 region VL epitope 1

<400> 77
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ala Ala Ser Pro Gly
 1 5 10 15
 Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Ser
 20 25 30
 Asn Leu His Trp Tyr Gln Gln Lys Ser Glu Thr Ser Pro Lys Pro Trp
 35 40 45
 Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
 50 55 60
 Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
 65 70 75 80
 Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Gly Ser Tyr Pro
 85 90 95
 Leu Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
 100 105

<210> 78
 <211> 107
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C1 region VL epitope 1

<400> 78
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1 5 10 15
 Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30
 Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
 35 40 45
 Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser Gly Ser
 50 55 60
 Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu

| | | | |
|---|----|----|----|
| 65 | 70 | 75 | 80 |
| Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Leu Thr | | | |
| 85 | | 90 | 95 |

| |
|---|
| Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg |
| 100 105 |

<210> 79
 <211> 109
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 S25 region VL epitope 1

| |
|---|
| <400> 79 |
| Asp Ile Glu Leu Thr Gln Ser Pro Ala Leu Met Ala Ala Ser Pro Gly |
| 1 5 10 15 |

| |
|---|
| Glu Lys Val Ile Ile Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser |
| 20 25 30 |

| |
|---|
| Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Pro Trp |
| 35 40 45 |

| |
|---|
| Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser |
| 50 55 60 |

| |
|---|
| Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu |
| 65 70 75 80 |

| |
|---|
| Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro |
| 85 90 95 |

| |
|---|
| Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg |
| 100 105 |

<210> 80
 <211> 112
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1B6 region VL epitope 1

| |
|---|
| <400> 80 |
| Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly |
| 1 5 10 15 |

| |
|---|
| Gln Arg Ala Ile Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr |
| 20 25 30 |

| |
|---|
| Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro |
| 35 40 45 |

| |
|---|
| Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Ser Gly Ile Pro Ala |
|---|

| | | | | |
|---|-----|----|-----|-------|
| 50 | | 55 | | 60 |
| Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn | | | | |
| 65 | | 70 | | 75 80 |
| Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn | | | | |
| | 85 | | 90 | 95 |
| Glu Asp Pro Pro Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg | | | | |
| | 100 | | 105 | 110 |

<210> 81
 <211> 112
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1C9 region VL epitope 1

| |
|---|
| <400> 81 |
| Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly |
| 1 5 10 15 |
| Gln Arg Ala Ile Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr |
| 20 25 30 |
| Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro |
| 35 40 45 |
| Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Ser Gly Ile Pro Ala |
| 50 55 60 |
| Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn |
| 65 70 75 80 |
| Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn |
| 85 90 95 |
| Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg |
| 100 105 110 |

<210> 82
 <211> 107
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1E8 region VL epitope 1

| |
|---|
| <400> 82 |
| Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly |

| | | | |
|-------------|-------------------------|-----------------|-------------|
| 1 | 5 | 10 | 15 |
| Glu Lys Val | Ile Met Thr Cys Ser Ala | Ser Ser Ser Val | Ser Tyr Met |
| 20 | 25 | 30 | |
| His Trp Tyr | Gln Gln Lys Ser Gly Thr | Ser Pro Lys Arg | Trp Ile Tyr |
| 35 | 40 | 45 | |
| Asp Thr Ser | Lys Leu Ala Ser Gly Val | Pro Ala Arg Phe | Ser Gly Ser |
| 50 | 55 | 60 | |
| Gly Ser Gly | Thr Ser Tyr Ser Leu Thr | Ile Ser Ser Met | Glu Ala Glu |
| 65 | 70 | 75 | 80 |
| Asp Ala Ala | Thr Tyr Tyr Cys Gln Gln | Trp Ser Ser Asn | Pro Leu Thr |
| 85 | 90 | 95 | |
| Phe Gly Ala | Gly Thr Lys Leu Glu | Leu Lys Arg | |
| 100 | 105 | | |

<210> 83

<211> 107

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1G7 region VL epitope 1

<400> 83

| | | | |
|-------------|-------------------------|-----------------|-------------|
| Asp Ile Glu | Leu Thr Gln Ser Pro Ala | Ile Met Ser Ala | Ser Pro Gly |
| 1 | 5 | 10 | 15 |
| Glu Lys Val | Ile Met Thr Cys Ser Ala | Ser Ser Ser Val | Ser Tyr Met |
| 20 | 25 | 30 | |
| His Trp Tyr | Gln Gln Lys Ser Gly Thr | Ser Pro Lys Arg | Trp Ile Tyr |
| 35 | 40 | 45 | |
| Asp Thr Ser | Lys Leu Ala Ser Gly Val | Pro Ala Arg Phe | Ser Gly Ser |
| 50 | 55 | 60 | |
| Gly Ser Gly | Thr Ser Tyr Ser Leu Thr | Ile Ser Ser Met | Glu Ala Glu |
| 65 | 70 | 75 | 80 |
| Asp Ala Ala | Thr Tyr Tyr Cys Gln Gln | Trp Ser Ser Asn | Pro Leu Thr |
| 85 | 90 | 95 | |
| Phe Gly Ala | Gly Thr Lys Leu Glu | Leu Lys Arg | |
| 100 | 105 | | |

<210> 84

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1A1 region VL epitope 2

<400> 84

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15
Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
85 90 95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 85

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1F1 region VL epitope 2

<400> 85

Asp Ile Glu Leu Thr Gln Ser Pro Thr Ser Leu Ala Val Ser Leu Gly
1 5 10 15
Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30
Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45
Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60
Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80
Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
85 90 95
Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 86
 <211> 112
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C39 region VL epitope 2

<400> 86
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1 5 10 15
 Arg Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
 20 25 30
 Gly His Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
 35 40 45
 Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
 50 55 60
 Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
 65 70 75 80
 Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
 85 90 95
 Glu Asp Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
 100 105 110

<210> 87
 <211> 112
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 C25 region VL epitope 2

<400> 87
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
 1 5 10 15
 Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
 20 25 30
 Gly His Ser Phe Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
 35 40 45
 Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Pro Gly Ile Pro Ala
 50 55 60
 Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
 65 70 75 80

Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
85 90 95

Glu Asp Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 88
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/a clone
2G5 region VL epitope 2

<400> 88
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15
Glu Lys Val Thr Thr Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30
His Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Leu Trp Ile Tyr
35 40 45
Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
50 55 60
Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65 70 75 80
Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Arg Ser Ser Tyr Pro Tyr Thr
85 90 95
Phe Gly Gly Gly Asp Gln Ala Gly Asn Lys Ser
100 105

<210> 89
<211> 112
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
3C3 region VL epitope 2

<400> 89
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15
Glu Lys Val Thr Thr Thr Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30
Gly His Ser Phe Met Gln Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro
35 40 45

Lys Leu Trp Ile Tyr Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala
 50 55 60
 Arg Phe Ser Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser
 65 70 75 80
 Arg Met Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Arg Ser
 85 90 95
 Ser Tyr Pro Tyr Thr Phe Gly Gly Gly Asp Gln Ala Gly Asn Lys Arg
 100 105 110

<210> 90
 <211> 107
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 3F4 region VL epitope 2

<400> 90
 Asp Thr Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1 5 10 15
 Glu Lys Val Thr Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30
 Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Trp Ile Tyr
 35 40 45
 Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser Gly Ser
 50 55 60
 Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
 65 70 75 80
 Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Pro Thr
 85 90 95
 Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
 100 105

<210> 91
 <211> 109
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 3H4 region VL epitope 2

<400> 91
 Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
 1 5 10 15

Glu Lys Val Thr Met Thr Cys Arg Ala Ser Ser Ser Val Ser Ser Ser
 20 25 30
 Tyr Leu Gln Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Trp
 35 40 45
 Ile Tyr Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
 50 55 60
 Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu
 65 70 75 80
 Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
 85 90 95
 Pro Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
 100 105

<210> 92
 <211> 109
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1B3 region VL epitope 3

<400> 92
 Asp Ser Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
 1 5 10 15
 Glu Lys Ile Thr Thr Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Asn
 20 25 30
 Tyr Leu His Trp Tyr Gln Gln Arg Pro Gly Phe Ser Pro Lys Leu Leu
 35 40 45
 Ile Tyr Arg Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
 50 55 60
 Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Thr Met Glu
 65 70 75 80
 Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
 85 90 95
 Arg Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
 100 105

<210> 93
 <211> 111
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: BoNT/A clone
 1C6 region VL epitope 3

<400> 93

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Ile | Glu | Leu | Thr | Gln | Ser | Pro | Ala | Ser | Leu | Ala | Val | Ser | Leu | Gly |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Arg | Arg | Ala | Thr | Thr | Ser | Cys | Arg | Ala | Ser | Glu | Ser | Val | Glu | Tyr | Tyr |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Thr | Ser | Leu | Met | Gln | Trp | Tyr | Gln | Gln | Lys | Pro | Gly | Gln | Pro | Pro |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Lys | Leu | Leu | Ile | Tyr | Ala | Ala | Ser | Asn | Val | Glu | Ser | Gly | Val | Pro | Ala |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Arg | Phe | Ser | Gly | Ser | Gly | Ser | Gly | Thr | Asp | Phe | Ser | Leu | Asn | Ile | His |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Pro | Val | Glu | Glu | Asp | Ile | Ala | Met | Tyr | Phe | Cys | Gln | Gln | Ser | Arg | Lys |
| | | | | 85 | | | | | 90 | | | | | 95 | |
| Val | Pro | Trp | Thr | Phe | Gly | Gly | Gly | Thr | Lys | Leu | Glu | Ile | Lys | Arg | |
| | | | 100 | | | | | 105 | | | | | 110 | | |

<210> 94

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
2B6 region VL epitope 3

<400> 94

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ile | Glu | Leu | Thr | Gln | Ser | Pro | Ala | Ser | Leu | Ala | Val | Ser | Leu | Gly |
| 1 | | | | 5 | | | | | 10 | | | | | 15 | |
| Gln | Arg | Ala | Thr | Thr | Ser | Cys | Arg | Ala | Ser | Glu | Ser | Val | Asp | Ser | Tyr |
| | | | 20 | | | | | 25 | | | | | 30 | | |
| Gly | Asn | Ser | Phe | Met | His | Trp | Tyr | Gln | Gln | Lys | Pro | Gly | Gln | Pro | Pro |
| | | 35 | | | | | 40 | | | | | 45 | | | |
| Lys | Leu | Leu | Ile | Tyr | Leu | Ala | Ser | Asn | Leu | Glu | Ser | Gly | Val | Pro | Ala |
| | 50 | | | | | 55 | | | | | 60 | | | | |
| Arg | Phe | Ser | Gly | Ser | Gly | Ser | Arg | Thr | Asp | Phe | Thr | Leu | Thr | Ile | Asp |
| 65 | | | | | 70 | | | | | 75 | | | | | 80 |
| Pro | Val | Glu | Ala | Glu | Asp | Ala | Ala | Thr | Tyr | Tyr | Cys | Gln | Gln | Asn | Asn |
| | | | | 85 | | | | 90 | | | | | | 95 | |
| Glu | Asp | Pro | Tyr | Thr | Phe | Gly | Gly | Gly | Thr | Lys | Leu | Glu | Ile | Lys | Ser |
| | | | 100 | | | | | 105 | | | | | 110 | | |

<210> 95

<211> 112

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1G5 region VL epitope 3

<400> 95

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15
Gln Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Glu Tyr Tyr
20 25 30
Gly Thr Ser Leu Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45
Lys Leu Leu Ile Tyr Ala Ala Ser Asn Val Glu Ser Gly Ala Pro Ala
50 55 60
Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Ser Leu Asn Ile His
65 70 75 80
Pro Val Glu Glu Asp Asp Ile Ala Met Tyr Phe Cys Gln Gln Ser Arg
85 90 95
Lys Val Pro Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 96

<211> 109

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: BoNT/A clone
1H6 region VL epitope 3

<400> 96

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15
Glu Lys Val Thr Thr Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser
20 25 30
Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Leu Trp
35 40 45
Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
50 55 60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65 70 75 80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
85 90 95
Leu Thr Phe Gly Ala Gly Thr Lys Val Glu Leu Arg Arg
100 105

<210> 97
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
1F3 region VL epitope 4

<400> 97
Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Met Ser Ala Ser Pro Gly
1 5 10 15
Glu Lys Val Thr Met Thr Cys Arg Ala Thr Ser Ser Val Ser Ser Ser
20 25 30
Tyr Leu His Trp Tyr Gln Gln Lys Ser Gly Ala Ser Pro Lys Leu Trp
35 40 45
Ile Tyr Ser Ala Ser Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser
50 55 60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Val Glu
65 70 75 80
Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ile Gly Tyr Pro
85 90 95
Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 98
<211> 109
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: BoNT/A clone
2E8 region VL epitope 4

<400> 98
Asp Ile Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
1 5 10 15
Glu Lys Ile Thr Ile Thr Cys Ser Ala Ser Ser Ser Ile Gly Ser Asn
20 25 30
Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Phe Ser Pro Lys Leu Leu
35 40 45
Ile Tyr Arg Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
50 55 60
Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Ala Met Glu
65 70 75 80
Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
85 90 95

Tyr Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

A3
cont